

REMARKS

This Amendment is in response to the non-final Office action (Paper No. 20100828) mailed on 3 September 2010. Reexamination and reconsideration are respectfully requested.

Listing of The Claims

Pursuant to 37 CFR §121(c), the claim listing, including the text of the claims, will serve to replace all prior versions of the claims, in the application.

Status of The Claims

Claims 1-20 are canceled.

Claims 21-24, 26-27, 29-32 are pending in this application.

Amendment of The Claims

Claims 21-24 and 26-27 are amended. Claims 25 and 28 are cancelled without disclaiming the subject matter thereof. Claims 29-32 are newly added.

Issues Raised by Paper No. 20100828

In the Non-final Office action (Paper No. 20100828), the Examiner stated:

- Claims 21-28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
- Claims 21, 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okabe et al. (3,859,412).

- Claims 21-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over CN-1,240,763 in view of Okabe '412.
- Claims 21, 23-25-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over CN 1,226,512 in view of Okabe '412.
- Claims 22, 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okabe '412 as applied to claims 21, 23-25, and further in view of CN '763.
- Claims 22, 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over CN '512 in view of Okabe '412 as applied to claims 21, 23-25, and further in view of CN '763.

Applicant respectfully traverses these rejections for the following reasons.

I. Claim Rejection – 35 U.S.C. §112

Claims 21-28 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

I-1. Claim 21

Regarding claim 21, on page 2 of Paper No. 20100828, the Examiner stated:

“In claim 21, it is unclear if the “primary potassium chromate” in the “separating” step is the intended product “chromate” as mentioned in the preamble; also, the limitation “an aqueous solution of potassium hydroxide with a concentration ranged from 0 to 30% by weight” in the “leaching” step is indefinite because at “0%”, the solution is not an aqueous of potassium hydroxide.”

First, Applicant respectfully submits that the "primary potassium chromate" in the "separating" step may not be the intended product "chromate" as mentioned in the preamble of the previously presented claim 21. Rather, the primary potassium chromate product may be only an intermediate product. Here, claim 21 is amended to change the "chromate" in the preamble to read - - a high-purity potassium chromate crystal - - in order to differentiate the intermediate product "primary potassium chromate".

Second, Applicant respectfully submits that in the present invention, the concentration of the aqueous solution of potassium hydroxide is greater than 0 (not including 0) and less or equal to 30% by weight. Accordingly, claim 21 is amended to change "an aqueous solution of potassium hydroxide with a concentration ranged from 0 to 30% by weight" to read - - water or an aqueous solution of potassium hydroxide with a concentration ranged from greater than 0 to 30% by weight - - .

In view of the amendment of claim 21, the rejection of claim 21 under 35 U.S.C. §112 should be withdrawn.

I-2. Claim 22

Regarding claim 22, on pages 2-3 of Paper No. 20100828, the Examiner stated:

"In claim 22, there is no clear antecedent basis for "the primary chromate products" (plural form, it should be note in claim 21, the primary chromate product is in singular form); for "the precipitates" in the "adjusting pH" step. It is also unclear what is required by "after crystallizing, filtering, and drying mother liquor", i.e. does the evaporating step result in the "crystallizing", where is the mother liquor coming from, what is being dried, the chromate crystal or the mother liquor."

First, Applicant respectfully submits that the "primary chromate products" in claim 22 may be read as referring to the "primary chromate product" in claim 21. Therefore, claim 22 is amended to change "primary chromate products" to read - - primary chromate product - - .

Second, the "precipitates" in claim 22 refers to some soluble impurity, such as potassium aluminate, which was originally contained in the primary chromate product and becomes insoluble precipitates, such as aluminum hydroxide, after the step of adjusting the pH value of the chromate aqueous solution. Accordingly, the claim limitation "the precipitates" in claim 22 is amended to read - - precipitates generated during the step of adjusting the pH value of the chromate aqueous solution - - .

Third, the "crystallizing, filtering, and drying mother liquor" refers to an evaporative crystallization process, in which the pure chromate aqueous solution is heated to evaporate water from the solution and to increase the solute concentration above a solubility threshold, so that the potassium chromate crystal precipitates from the solution; then, the potassium chromate crystal precipitates is filtered from the solution, and is dried to obtain the high-purity potassium chromate crystal. Accordingly, the claim limitation "heating the pure chromate aqueous solution to evaporate the water and obtaining pure chromate crystal after crystallizing, filtering, and drying mother liquor" is amended to read - - separating potassium chromate from the pure potassium chromate aqueous solution using an evaporation crystallization method by heating the pure potassium chromate aqueous solution to evaporate [[the]] water from the pure potassium chromate aqueous solution to obtain potassium chromate crystal precipitates and a mother liquor, filtering the potassium chromate crystal

precipitates from the mother liquor and drying the potassium chromate crystal precipitates to obtain the high-purity potassium chromate crystal.

In view of the amendment of claim 22, the rejection of claim 22 under 35 U.S.C. §112 should be withdrawn.

I-3. Claim 24

Regarding claim 24, on page 3 of Paper No. 20100828, the Examiner stated:

“In claim 24, it is unclear if “the potassium hydroxide” refers to the potassium hydroxide in the decomposing step or the leaching step or both.”

Applicant respectfully submits that “the potassium hydroxide” in claim 24 refers to the potassium hydroxide in aqueous solution that reacts with the chromite ore in step (1). Accordingly, claim 24 is amended to change “the potassium hydroxide” to read - - the potassium hydroxide in the first aqueous solution of potassium hydroxide that reacts with the chromite ore - - .

In view of the amendment of claim 24, the rejection of claim 24 under 35 U.S.C. §112 should be withdrawn.

I-4. Claim 25

Regarding claim 25, on page 3 of Paper No. 20100828, the Examiner stated:

“In claim 25, it is unclear what needs to be done to obtain the “potassium hydroxide aqueous solution” from the “potassium hydroxide liquor”.”

Applicant respectfully submits that the term "potassium hydroxide liquor" is the same as the term "potassium hydroxide aqueous solution". In order to avoid further confusion, claim 25 is cancelled.

According, the rejection of claim 25 under 35 U.S.C. §112 should be withdrawn.

I-5. Claim 26

Regarding claim 26, on page 3 of Paper No. 20100828, the Examiner stated:

"In claim 26, "a potassium hydroxide aqueous solution with a concentration ranged from 0 to 20% by weight" is indefinite for the same reason as stated above for claim 21."

Here, claim 26 is amended to read - - wherein the aqueous solution used to dissolve the primary chromate products is the mother liquor obtained in the step of heating the pure potassium chromate aqueous solution - - . The support for this amendment can be found in the third paragraph of page 5 of Applicant's original specification as filed on 19 September 2005.

In view of the amendment of claim 26, the rejection of claim 26 under 35 U.S.C. §112 should be withdrawn.

I-6. Claim 28

Regarding claim 28, on page 3 of Paper No. 20100828, the Examiner stated:

"In claim 28, there is not clear antecedent basis for "the aqueous solution obtained as the mother liquor"."

Here, claim 28 is cancelled because claim 28 duplicates the amended claim 26.

According, the rejection of claim 28 under 35 U.S.C. §112 should be withdrawn.

II. Claim Rejection – 35 U.S.C. §103(a)

II-1. Claims 21, 23-25 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Okabe et al (3,859,412).

(1) Claim 21

In this Amendment, claim 21 is amended to recite that “*the reaction temperature is in a range from 200 °C to 350 °C*”.

As explained in the Inventor’s Declaration filed together with this Amendment, Okabe ‘412 requires a reaction temperature of more than 400 °C.

Specifically, Okabe ‘412’s system requires chrome ore to react with a melting alkali metal hydroxide (such as potassium hydroxide or sodium hydroxide) by using a nitrogen oxyacid as an oxidant, for decomposing the chrome ore. Only when the temperature of the mixture of the alkali metal hydroxide and the nitrogen oxyacid is above 400 °C, the mixture can be melted. If the reaction temperature is below 400 °C in Okabe ‘412’s system, the alkali metal hydroxide and the nitrogen oxyacid can not be formed in a molten state, and the chrome ore cannot be effectively decomposed.

On the other hand, in the present invention, the chromite ore reacts with water or/and an aqueous solution of potassium hydroxide, by using air or oxygen as an oxidant, for decomposing the chromite ore. Because the potassium hydroxide can exist in a liquid state in a relatively low temperature, the reaction temperature of the present invention can be lower than 400 °C, i.e., in a range of 200~350 °C, which is not taught or suggested by Okabe ‘412.

Therefore, the amended claim 21, and the dependent claims thereof, are patentably distinguishable over Okabe '412.

(2) Claim 23

In this Amendment, claim 23 is amended to recite that *"the oxidant is air or oxygen"*.

As explained in the Inventor's Declaration filed together with this Amendment, in Okabe '412's system uses a nitrogen oxyacid (such as sodium nitrite) as an oxidant, which is expensive and may generate hazardous gas such as nitrogen oxides.

On the other hand, the present invention uses the oxygen in the air as the oxidant. Since the oxygen is easy to obtain from the air, the production cost can be reduced, and no hazardous gas will be generated. Therefore, the present invention is more suitable for massive industrial production.

More specifically, as disclosed in col. 3, line 65 -- col. 4, line 14 of Okabe '412, it is preferable to react the alkali metal contained in a residue with the nitrogen oxyacid to recover the alkali metal content in the residue as an alkali metal salt of a nitrogen oxyacid, and to recycle the recovered alkali metal hydroxide to the reaction between the chrome ore and the alkali metal hydroxide.

If Okabe '412's system uses air or oxygen as the oxidant, the alkali metal can not be recovered and recycled back to the reaction between the chrome ore and the alkali metal hydroxide. In this way, the Okabe '412 cannot operate in its intended mode of operation. As stated in MPEP §2143.01,

"If proposed modification would render the prior art invention being modified unsatisfactory for its intended

purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)".

Therefore, there is no teaching or suggestion to modify Okabe '412's system to use air or oxygen as the oxidant.

Therefore, the amended claim 23 is patentably distinguishable over Okabe '412.

II-2. Claims 21-28 stand rejected under 35 U.S.C. 1 03(a) as being unpatentable over CN-1 ,240,763 in view of Okabe '412.

(1) Claim 21

As discussed previously, in this Amendment, the claim 21 is amended to recite that "*the reaction temperature is in a range from 200 °C to 350 °C*".

As explained in the Inventor's Declaration filed together with this Amendment, CN '763's method is used for produce sodium chromate, which requires a relatively high temperature -- 500 °C to 600 °C. This high temperature may undesirably damage the manufacturing equipment for producing the sodium chromate.

In addition, as discussed previously, Okabe '412's method requires a reaction temperature of above 400 °C in order to obtain a mixture of the alkali metal hydroxide and the nitrogen oxyacid in a molten state.

Therefore, neither one of CN '763 and Okabe '412, nor the combination thereof, teaches or suggests a reaction temperature in a range of 200 °C to 350 °C.

Consequently, the amended claim 21, and the dependent claims thereof, are patentably distinguishable over the combination of CN '763 and Okabe '412.

(2) Claim 22

Another patentable distinction between the pending claims and the prior art is that CN '763 fails to teach or suggest claim 22's *"separating potassium chromate from the pure potassium chromate aqueous solution using an evaporation crystallization method"*.

As explained in the Inventor's Declaration filed together with this Amendment, CN '763's method is used to produce sodium chromate. The solubility of sodium chromate in sodium hydroxide solution is relatively high, but the solubility varies largely with temperature. Therefore, the CN '763 uses a cooling crystallization method to separate the sodium chromate from the sodium hydroxide solution, and thus obtaining sodium chromate crystal with a high crystallization ratio of about 55%.

On the other hand, in the present invention, the solubility of potassium chromate in the potassium hydroxide solution is small. If the potassium chromate is separated from the potassium hydroxide solution using the cooling crystallization method as taught by CN '763 patents, the crystallization ratio for potassium chromate crystal would be about 17%, which is very low.

Therefore, the present invention uses the evaporation crystallization method to separate the potassium chromate from the potassium hydroxide solution, thus obtaining the potassium chromate crystal with a high crystallization ratio of about 95.8%.

Note that although Okabe '412 teaches crystallization to obtain the desired alkali metal chromate, Okabe '412 fails to teach or suggest that the alkali metal chromate can be obtained by using the evaporation crystallization method.

Consequently, the amended claim 22 is patentably distinguishable over the combination of CN '763 and Okabe '412.

II-3. Claims 21, 23-25-20 stand rejected under 35 U.S.C. §103(a) as being unpatentable over CN 1,226,512 in view of Okabe '412.

(1) Claim 21

As discussed previously, in this Amendment, the claim 21 is amended to recite that *"the reaction temperature is in a range from 200 °C to 350 °C"*.

As explained in the Inventor's Declaration filed together with this Amendment, CN '512's method is used for produce sodium chromate, which requires a relatively high temperature -- 500 °C to 550 °C. This high temperature may undesirably damage the manufacturing equipment for producing the sodium chromate.

In addition, as discussed previously, Okabe '412's method requires a reaction temperature of above 400 °C in order to obtain a mixture of the alkali metal hydroxide and the nitrogen oxyacid in a molten state.

Therefore, neither one of CN '512 and Okabe '412, nor the combination thereof, teaches or suggests a reaction temperature in a range of 200 °C to 350 °C.

Consequently, the amended claim 21, and the dependent claims thereof, are patentably distinguishable over the combination of CN '512 and Okabe '412.

(2) Claim 22

Another patentable distinction between the pending claims and the prior art is that CN '512 fails to teach or suggest claim 22's *"separating potassium chromate from*

the pure potassium chromate aqueous solution using an evaporation crystallization method".

As explained in the Inventor's Declaration filed together with this Amendment, CN '763's method is used for produce sodium chromate. The solubility of sodium chromate in sodium hydroxide solution is relatively high, but the solubility varies largely with temperature. Therefore, the CN '763 uses a cooling crystallization method to separate the sodium chromate from the sodium hydroxide solution, and thus obtaining sodium chromate crystal with a high crystallization ratio of about 55%.

On the other hand, in the present invention, the solubility of potassium chromate in the potassium hydroxide solution is small. If the potassium chromate is separated from the potassium hydroxide solution using the cooling crystallization method as taught by CN '512 patents, the crystallization ratio for potassium chromate crystal would be about 17%, which is very low.

Therefore, the present invention uses the evaporation crystallization method to separate the potassium chromate from the potassium hydroxide solution, thus obtaining the potassium chromate crystal with a high crystallization ratio of about 95.8%.

Note that although Okabe '412 teaches crystallization to obtain the desired alkali metal chromate, Okabe '412 fails to teach or suggest that the alkali metal chromate can be obtained by using the evaporation crystallization method.

Consequently, the amended claim 22 is patentably distinguishable over the combination of CN '512 and Okabe '412.

In view of the foregoing amendments and remarks, all claims are deemed to be allowable and this application is believed to be in condition to be passed to issue. If there are any questions, the examiner is asked to contact the applicant's attorney.

No fee is incurred by this Amendment.

Respectfully submitted,

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